

## INTERNATIONAL APPLICATION PUBLISHED UND)

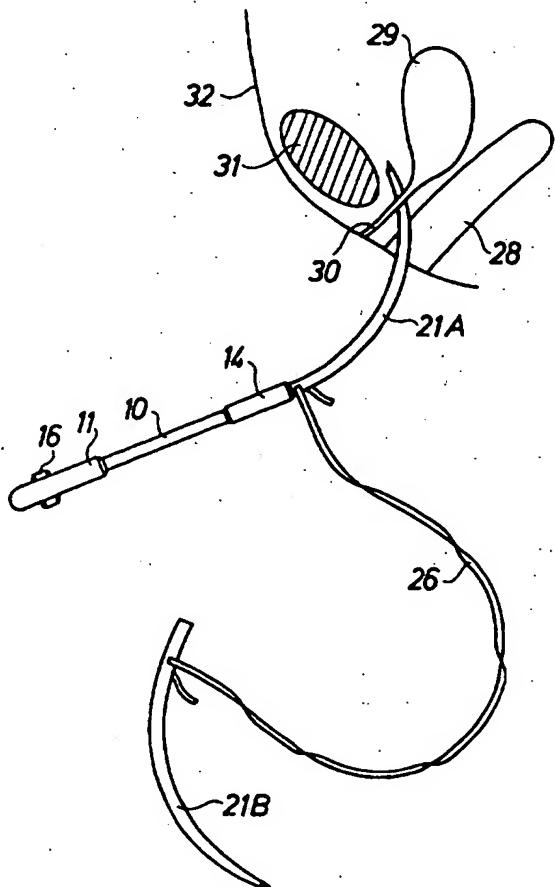
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## (54) Title: SURGICAL INSTRUMENT FOR TREATING FEMALE URINARY INCONTINENCE

## (57) Abstract

The invention relates to a surgical instrument and a method for treating female urinary incontinence. The instrument comprises a shank (10) having a handle (11) at one end thereof, and two curved needle-like elements (21A, 21B) which are connected at one end thereof each with one end of a tape (26) intended to be implanted into the body. These elements can be connected one at a time with the shank at the other end thereof to form a curved end portion of the shank and are intended to be passed into the body via the vagina, each element being dimensioned to extend from the inside of the vaginal wall over the back of the pubic bone to the outside of the abdominal wall. When practising the method the tape (26) is passed into the body via the vagina (28) first at one end and then at the other end at one side and the other, respectively, of the urethra (30) to form a loop around the vaginal wall. The tape is extended over the pubis (31) and through the abdominal wall (32) and is tightened. Then, the tape ends are cut at the abdominal wall, and the tape is left in the body.



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TITLE OF THE INVENTION: Surgical instrument for treating female urinary incontinence

The invention relates to a surgical instrument and a method for treating female urinary incontinence, i.e. incapacity of controlling the discharge of urine.

Urinary incontinence may be caused by a defect function 5 in the tissue or ligaments connecting the vaginal wall with the pelvic muscles and pubic bone.

US-A-5 112 344 describes a method for treating female urinary incontinence without the necessity of opening the abdomen, which would require hospital care for may be four 10 days. In this method a tape is passed into the body at each side of the urethra and is implanted between the vaginal wall and the abdominal wall extending over the pubis. The tape is tightened in order to bring the vaginal wall and the urethra into correct position in relation to the pubis and 15 is left in the body in order that fibrous tissue shall develop around the tape, said fibrous tissue functioning as a supporting ligament in the soft tissue. The tape is removed from the body when such fibrous tissue has developed, which takes about two months.

20 A surgical instrument of special construction is also proposed for use with this method, comprising a shank having a handle at one end thereof and a curved portion at the other end thereof said portion being intended to be passed into the body via the vagina.

25 The result obtained by such surgery is not always satisfactory due to the fact that fibrous tissue will not develop sufficiently since the soft tissue between the vaginal wall and the abdominal wall is in bad condition.

The object of the invention is to provide improved and simplified surgery with a considerably improved prognosis

with regard to restoration of the urinary continence, and for this purpose the invention provides a surgical instrument of the kind referred to above having the characterizing features of claim 1.

5 The invention also provides a method for treatment of female urinary incontinence in accordance with claim 17. Also in this method a tape is passed into the tissue between the vaginal wall and the abdominal wall but the tape is left permanently in the body to provide itself, as an artificial 10 ligament, the reinforcement of the tissue required in order to restore the urinary continence, or to provide said reinforcement by the development of fibrous tissue.

15 The invention will be explained in more detail with reference to the accompanying drawings which disclose the surgical instrument according to the invention as well as several surgical steps when practising the method of the invention using said surgical instrument.

In the drawings

20 FIG. 1 is a side view of the surgical instrument in one embodiment thereof,

FIG. 2 is a plan view of the surgical instrument,

FIG. 3 is an enlarged fragmentary axial cross sectional view of a coupling of the instrument for attaching an exchangeable part thereof,

25 FIGS. 4 to 10 illustrate diagrammatically several surgical steps of the method according to the invention, and

FIG. 11 in the same way illustrates the final step of the method.

30 The surgical instrument comprises a cylindrical tubular shank 10 having at one end thereof a handle 11 which forms two in opposite directions in a common plane projecting wings 12 and an opening 13. At the other end of the shank there is a socket 14 which is partly passed onto 35 the shank and is soldered or brazed to the shank, a portion of the socket projecting from the shank at said other end

thereof. A cylindrical shaft 15 is rotatably mounted in the shank and can be rotated manually by means of a knob 16 axially knurled at the outside surface thereof, which is mounted to one end of the shaft and is received by opening

- 5 13. The other end of the shaft forms a cylindrical portion 17 of smaller outside diameter than the shaft, which joins a portion 18 having external threads, a smooth end portion 19 of further reduced diameter joining the threaded portion 18, end portion 19 forming a guide pin at said other end of the  
10 shaft. Portions 18 and 19 are received in the portion of socket 14 projecting from the shank, and also a shoulder 20 projecting from the shank is received in said portion.

The surgical instrument as described so far is intended to be used several times and therefore should consist of a  
15 material which can be sterilized by autoclaving, e.g. of stainless steel.

The surgical instrument also includes an exchangeable and disposable element 21 which will be termed needle. It is attached to the shank at a straight portion at one end of  
20 the needle and extends over substantially a quarter of a circle to the other, free end thereof in order to follow substantially the profile of the pubis between the vagina and the abdominal wall. The needle has circular cross section and has a smooth, preferably polished outside  
25 surface. It tapers slightly towards the free end thereof where the needle forms a point 22 by being faceted but it can also be blunt-ended and have a transversely cut end. The practical use of the surgical instrument will show which embodiment is to be preferred. The disposable needle shall  
30 be made either of a tissue compatible plastics, such as polycarbonate, or of steel or a similar material.

For attachment of needle 21 to shank 10 the needle has at said one end thereof where the needle forms a straight portion to be received at said portion in socket 14, an axial blind hole extending from the end surface said hole having a threaded portion 23 and inwardly thereof a

narrower, cylindrical portion 24. Guide pin 19 is dimensioned to be guidingly received by said latter portion when the threaded portion 18 for attaching needle 21 to the rest of the surgical instrument is screwed into threaded 5 portion 23 of the blind hole by rotating shaft 15 by manual rotation of knob 16, the end surfaces of the shank and the needle being pressed against each other. The needle should be oriented in a predetermined rotational position in relation to the shank; it should project at right angles to 10 the plane of handle 16, and this rotational position is secured by shoulder 20 on the shank being received in a mating recess 25 in the outside surface of the needle.

Portion 23 of needle 21 instead of being threaded can be dimensioned such that the threaded portion 18 of shaft 15 15 cuts a thread in the plastics of the needle when being screwed thereinto.

When the two parts of the surgical instrument are screwed together in the manner described they form a rigid unit which can be controlled with great precision at handle 20 11 when it is used for surgery by applying the method of the invention.

When the method according to the invention is practised two needles 21A and 21B of the embodiment described shall be connected one at each end of a tape 26, Fig. 4. In the 25 preferred embodiment the tape end is glued to the needle but the connection can be effected also by the tape being passed through an eye 27, Fig. 3, in the needle adjacent the end attached to the shank or by the tape end being connected by ultrasonic welding to the needle or being baked into the plastics material of the needle at injection molding 30 thereof.

The tape should be a woven tape having apertures between weft and warp of the order of 0.1 mm in order that fibroblasts shall be able to grow into the tape for 35 anchoring of the tape in surrounding tissue. A suitable material for the tape is polypropylene which also can be

coated with a fibroblast stimulating substance, e.g. an enamel matrix derivative. Preferably the tape has a width of 8 to 10 mm and a thickness of about 1 mm.

When the surgery for implanting the tape shall start  
5 one needle 21A is attached to shank 10, the other needle 21B hanging loosely in tape 26 as shown in Fig. 4.

In Figs. 4 to 11 the relevant parts of the female lower abdomen is disclosed diagrammatically, the vagina being designated 28, the urinary bladder 29, the urethra 30, the  
10 pubic bone 31, and the abdominal wall 32.

The first step of the surgery for implanting tape 26 is disclosed in Fig. 4 and comprises penetration of the vaginal wall by needle 21A a cut having first been made in said wall, and also penetration of the soft tissue at one side of  
15 urethra 30, the needle then according to Fig. 5 being passed close to the back of the pubic bone 31 and then through the abdominal wall above the pubic bone. A cut can be done through the abdominal wall for the passage of the needle therethrough but if the needle is pointed it may be  
20 sufficient to let the needle penetrate into the abdominal wall from the inside thereof and to make a registering cut in the abdominal wall on the outside thereof.

The shank of the instrument is now disconnected from  
needle 21A, Fig. 6, by rotating shaft 15 at knob 16 so that  
25 the threaded portion 18 of the shaft is unscrewed from the threaded portion 23 in needle 21A said needle then being withdrawn from the abdominal wall by means of forceps and tape 26 being pulled into and through the tissue as illustrated in Fig. 7.

30 The other needle 21B is now attached to the shank, Fig. 8, and is passed through a cut in the vaginal wall to pass through the soft tissue at the other side of urethra 30. Needle 21B is passed through the abdominal wall, Fig. 9, and then, after having been disconnected from the shank, is  
35 withdrawn from the abdominal wall, Fig. 10, all in the same way as in the earlier procedure with needle 21A.

Tape 26 is now located at each side of urethra 30 as shown in Fig. 10 and is tightened with the loop formed by the tape located on the inside surface of the vaginal wall, Fig. 11. The surplus of the tape at the outside of the abdominal wall is cut off. Then, the tape is left as an implant in the body to form an artificial ligament attached to the abdominal wall and providing the support for urethra as required in order to restore the urinary continence.

Another kind of tape which may be used in the method according to the invention can be more closely woven than the tape mentioned above and can be of such material that the tape after a shorter or longer period will be completely resorbed. By the development of fibroblast proliferation stimulated by the tape the reinforcement of the tissue required in order to restore the urinary continence will be obtained.

## CLAIMS

1. Surgical instrument for treating female urinary incontinence, comprising a shank (10) having a handle (11) at one end thereof and a curved portion (21) at the other end thereof said portion being intended to be passed

5 into the body via the vagina,

characterized in that two curved needle-like elements (21A, 21B) which are each connected at one end thereof to one end of a tape (26) to be implanted into the body, are constructed to be connected one at the time with

10 the shank (10) to form said curved portion each element

being dimensioned to extend from the inside surface of the vaginal wall over the back of the pubic bone to the outside of the abdominal wall.

2. Instrument as in claim 1

15 characterized in that the shank (10) has a screw coupling (18, 23) for attachment of the element (21A, 21B) to the shank (10).

3. Instrument as in claim 2

20 characterized in that the screw coupling comprises a shaft (15) rotatably mounted in the shank (10) and having an operating knob (16) at one end of the shaft said knob being available at the handle end of the shank, and a threaded portion (18) at the other end of the shaft for screw engagement with the element (21A, 21B).

25 4. Instrument as in any of claims 1 to 3

characterized in that the shaft (10) has a sleeve portion (14) at said other end thereof to receive therein an end portion of the needle-like element (21A, 21B) at said one end of the element.

30 5. Instrument as in any of claims 1 to 4

characterized in that the handle (11) comprises two wings (12) projecting diametrically from the shank (10).

6. Instrument as in claim 5

characterized in that the shank (10) and the

needle-like elements (21A, 21B) have mutually co-operating means (20, 25) for positioning the respective elements on the shank (10) at right angles to the plane of the wings (12).

5        7. Instrument as in any of claims 1 to 6 characterized in that the shank (10) is intended for use several times and consists of a material that can be autoclaved, the needle-like elements (21A, 21B) being intended for a single use and consist of plastics material, stainless steel or similar material.

10       8. Instrument as in claim 7 characterized in that the tape (26) is attached to the associated element (21A, 21B) by the tape ends being glued or welded to the elements or being baked into the plastics material of the elements.

15       9. Instrument as in claim 7 characterized in that the tape ends are passed through an eye (27) in the associated element (21A, 21B).

20       10. Instrument as in any of claims 1 to 9 characterized in that the needle-like elements are curved over substantially a quarter of a circle.

25       11. Instrument as in any of claims 1 to 10 characterized in that the elements (21A, 21B) taper towards the other, free end thereof.

30       12. Instrument as in claim 11 characterized in that said other end is pointed.

35       13. Instrument as in claim 11 characterized in that said other end is blunt.

40       14. Instrument as in any of claims 1 to 13 characterized in that the tape (26) is perforated for growth of fibroblasts thereinto.

45       15. Instrument as in claim 14 characterized in that the tape (26) comprises a woven tape.

16. Instrument as in claims 14 or 15  
characterized in that the tape is coated with a  
fibroblast stimulating material.

17. Method for treating female urinary incontinence  
5 wherein a tape (26) is passed into the body and is implanted  
at each side of the urethra between the vaginal wall and the  
abdominal wall extending over the pubic bone, characterized  
in that the tape is passed into the body via  
the vagina first at one end thereof and then at the other  
10 end thereof at one side and the other, respectively, of  
urethra to form a loop around the vaginal wall, and that the  
tape is tightened.

## AMENDED CLAIMS

[received by the International Bureau on 9 January 1996 (09.01.96);  
original claim 17 amended;  
remaining claims unchanged (3 pages)]

1. Surgical instrument for treating female urinary incontinence, comprising a shank (10) having a handle (11) at one end thereof and a curved portion (21) at the other end thereof said portion being intended to be passed into the body via the vagina,  
characterized in that two curved needle-like elements (21A, 21B) which are each connected at one end thereof to one end of a tape (26) to be implanted into the body, are constructed to be connected one at the time with the shank (10) to form said curved portion each element being dimensioned to extend from the inside surface of the vaginal wall over the back of the pubic bone to the outside of the abdominal wall.
2. Instrument as in claim 1  
characterized in that the shank (10) has a screw coupling (18, 23) for attachment of the element (21A, 21B) to the shank (10).
3. Instrument as in claim 2  
characterized in that the screw coupling comprises a shaft (15) rotatably mounted in the shank (10) and having an operating knob (16) at one end of the shaft said knob being available at the handle end of the shank, and a threaded portion (18) at the other end of the shaft for screw engagement with the element (21A, 21B).
4. Instrument as in any of claims 1 to 3  
characterized in that the shaft (10) has a sleeve portion (14) at said other end thereof to receive therein an end portion of the needle-like element (21A, 21B) at said one end of the element.
5. Instrument as in any of claims 1 to 4  
characterized in that the handle (11) comprises two wings (12) projecting diametrically from the shank (10).

## 6. Instrument as in claim 5

characterized in that the shank (10) and the needle-like elements (21A, 21B) have mutually co-operating means (20, 25) for positioning the respective elements on the shank (10) at right angles to the plane of the wings (12).

## 7. Instrument as in any of claims 1 to 6

characterized in that the shank (10) is intended for use several times and consists of a material that can be autoclaved, the needle-like elements (21A, 21B) being intended for a single use and consist of plastics material, stainless steel or similar material.

## 8. Instrument as in claim 7

characterized in that the tape (26) is attached to the associated element (21A, 21B) by the tape ends being glued or welded to the elements or being baked into the plastics material of the elements.

## 9. Instrument as in claim 7

characterized in that the tape ends are passed through an eye (27) in the associated element (21A, 21B).

## 10. Instrument as in any of claims 1 to 9

characterized in that the needle-like elements are curved over substantially a quarter of a circle.

## 11. Instrument as in any of claims 1 to 10

characterized in that the elements (21A, 21B) taper towards the other, free end thereof.

## 12. Instrument as in claim 11

characterized in that said other end is pointed.

## 30 13. Instrument as in claim 11

characterized in that said other end is blunt.

## 14. Instrument as in any of claims 1 to 13

characterized in that the tape (26) is perforated for growth of fibroblasts thereinto.

15. Instrument as in claim 14

characterized in that the tape (26) comprises a woven tape:

16. Instrument as in claims 14 or 15

5 characterized in that the tape is coated with a fibroblast stimulating material.

17 (Amended). Method for treating female urinary incontinence wherein a tape (26) is passed into the body and is implanted at each side of the urethra between the vaginal wall and the abdominal wall extending over the 10 pubic bone, characterized in that the tape is passed into the body via the vagina first at one end thereof and then at the other end thereof at one side and the other, respectively, of urethra to form a loop around 15 urethra, and that the tape is tightened.

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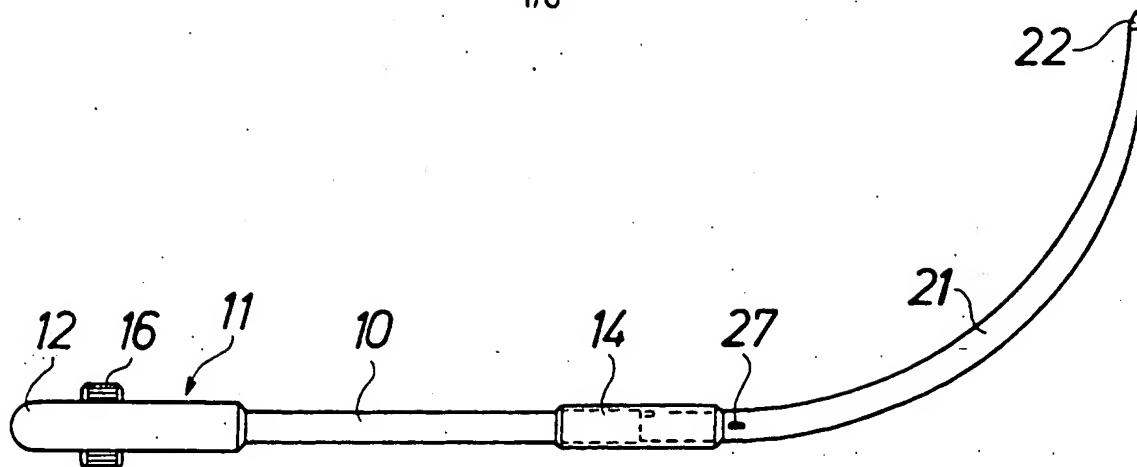


FIG. 1

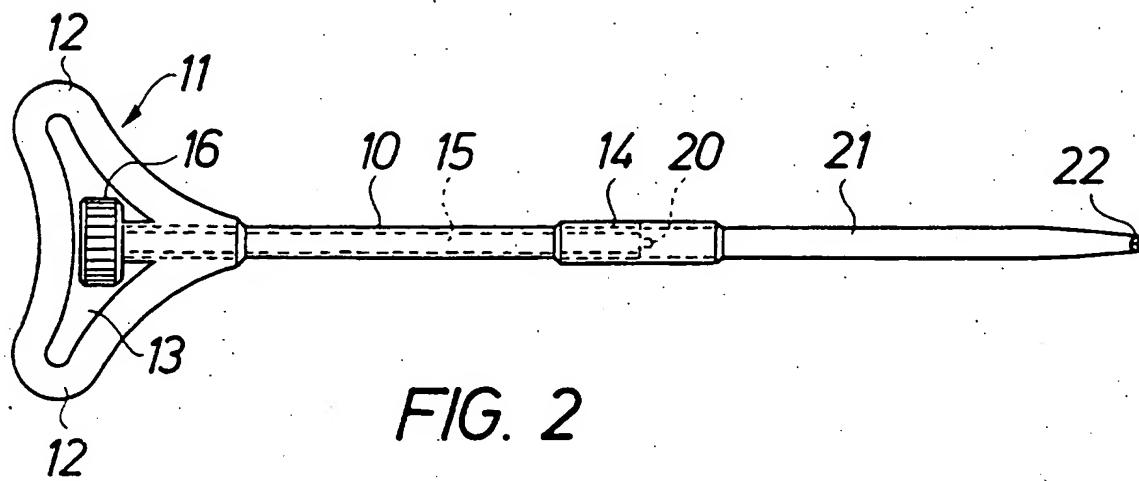


FIG. 2

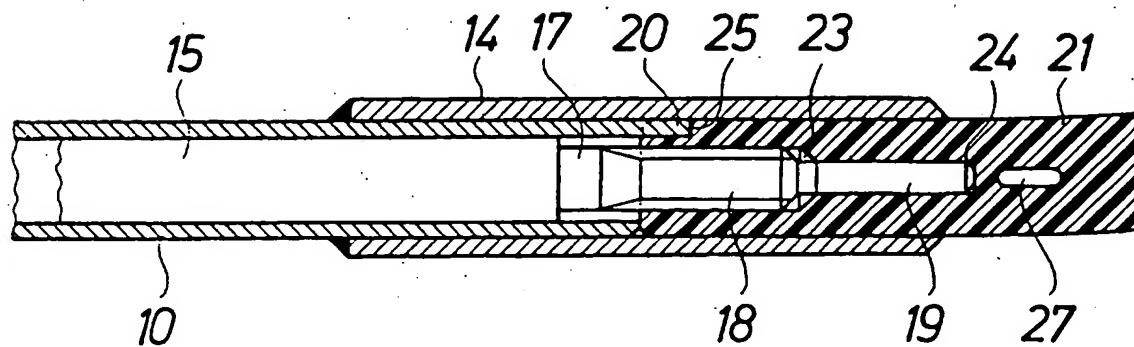


FIG. 3

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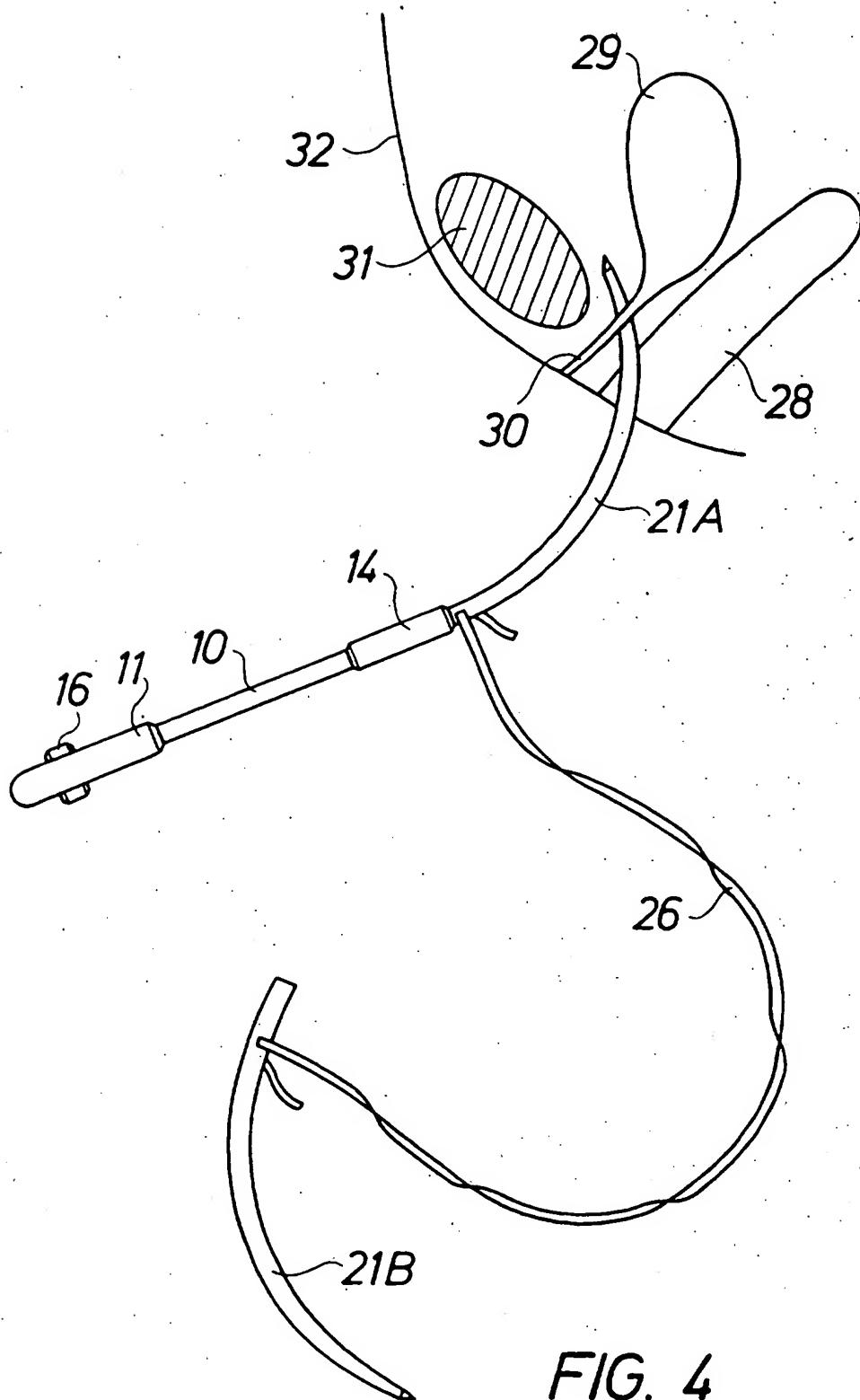


FIG. 4

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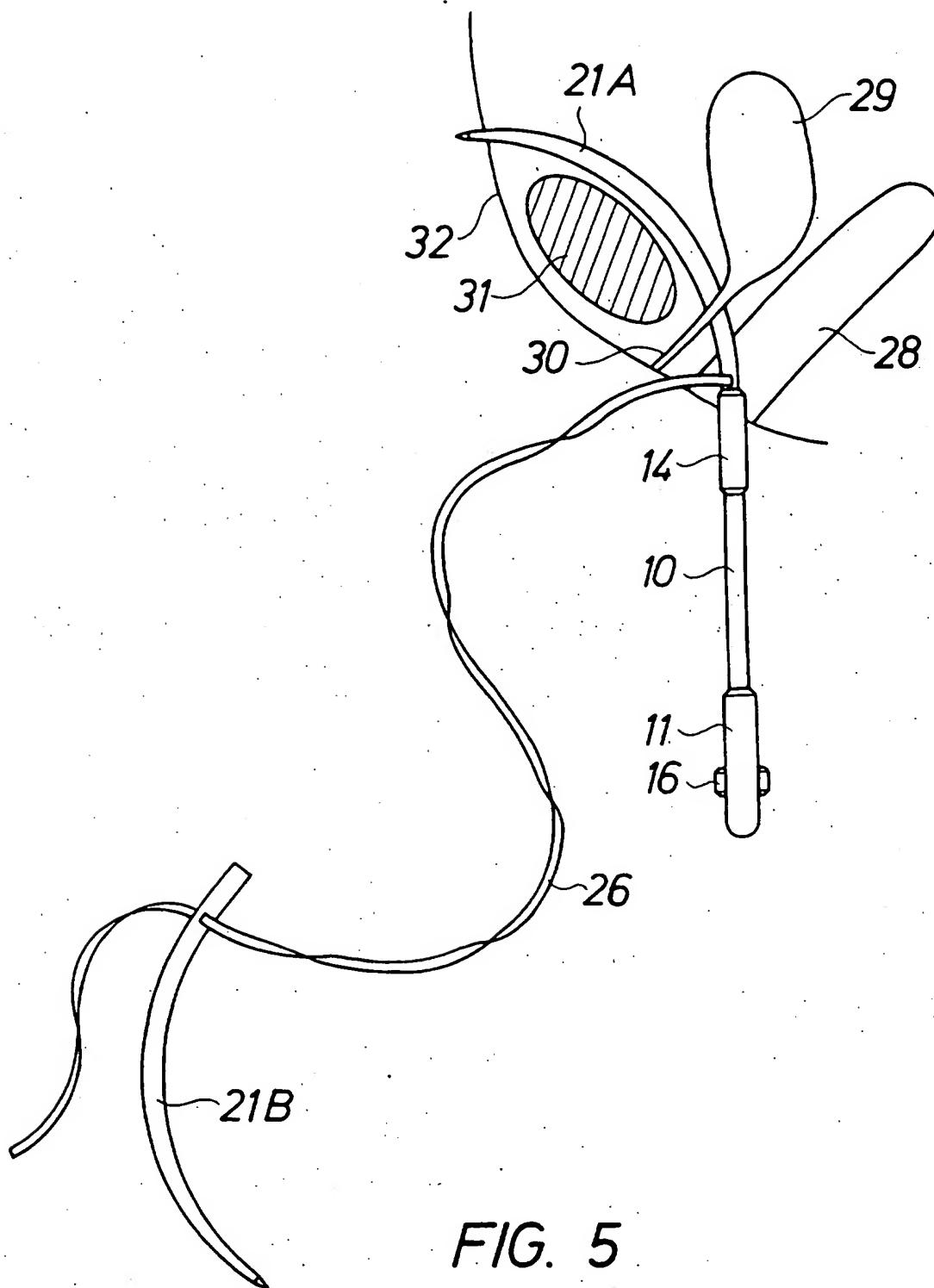
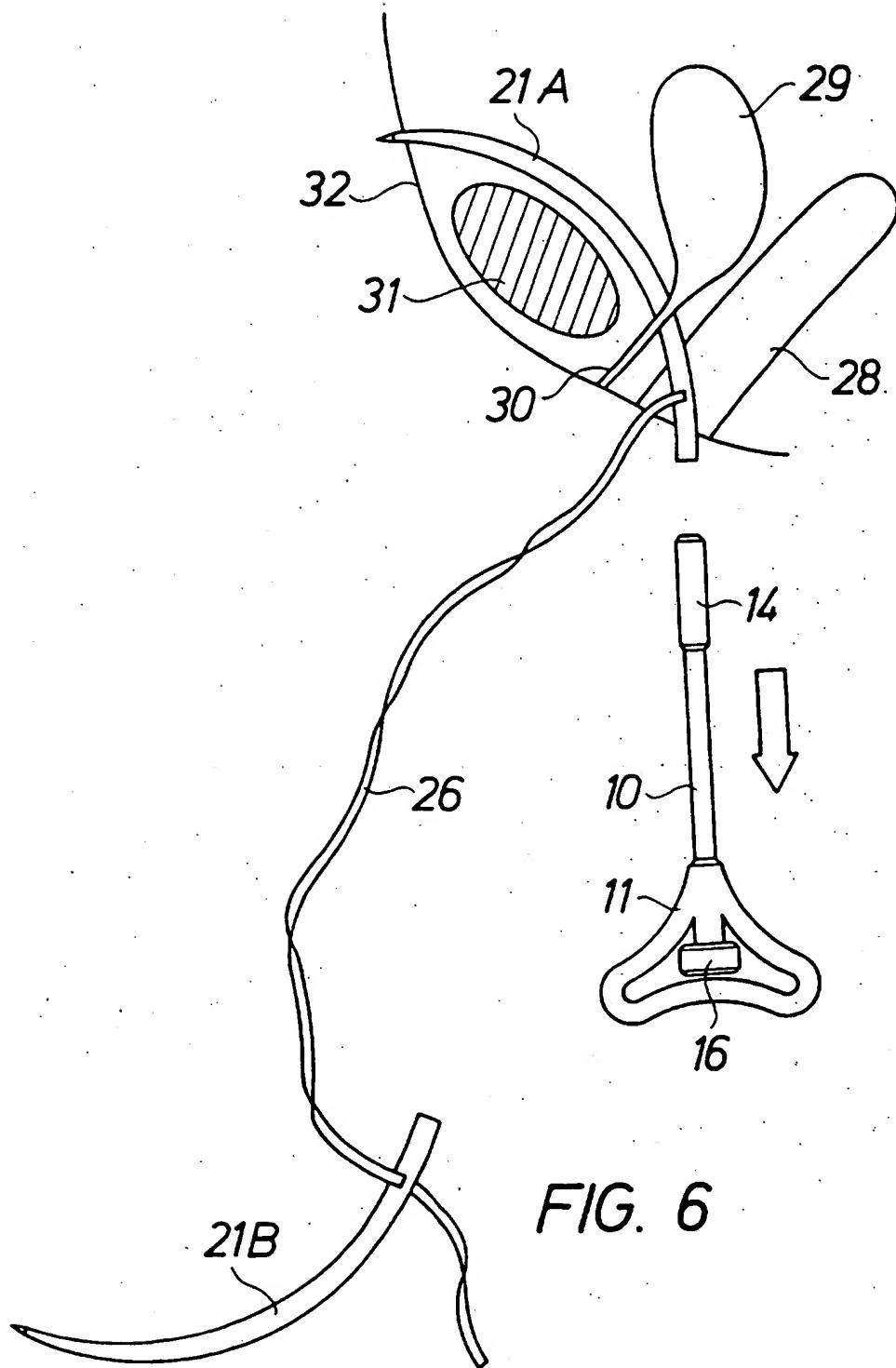


FIG. 5

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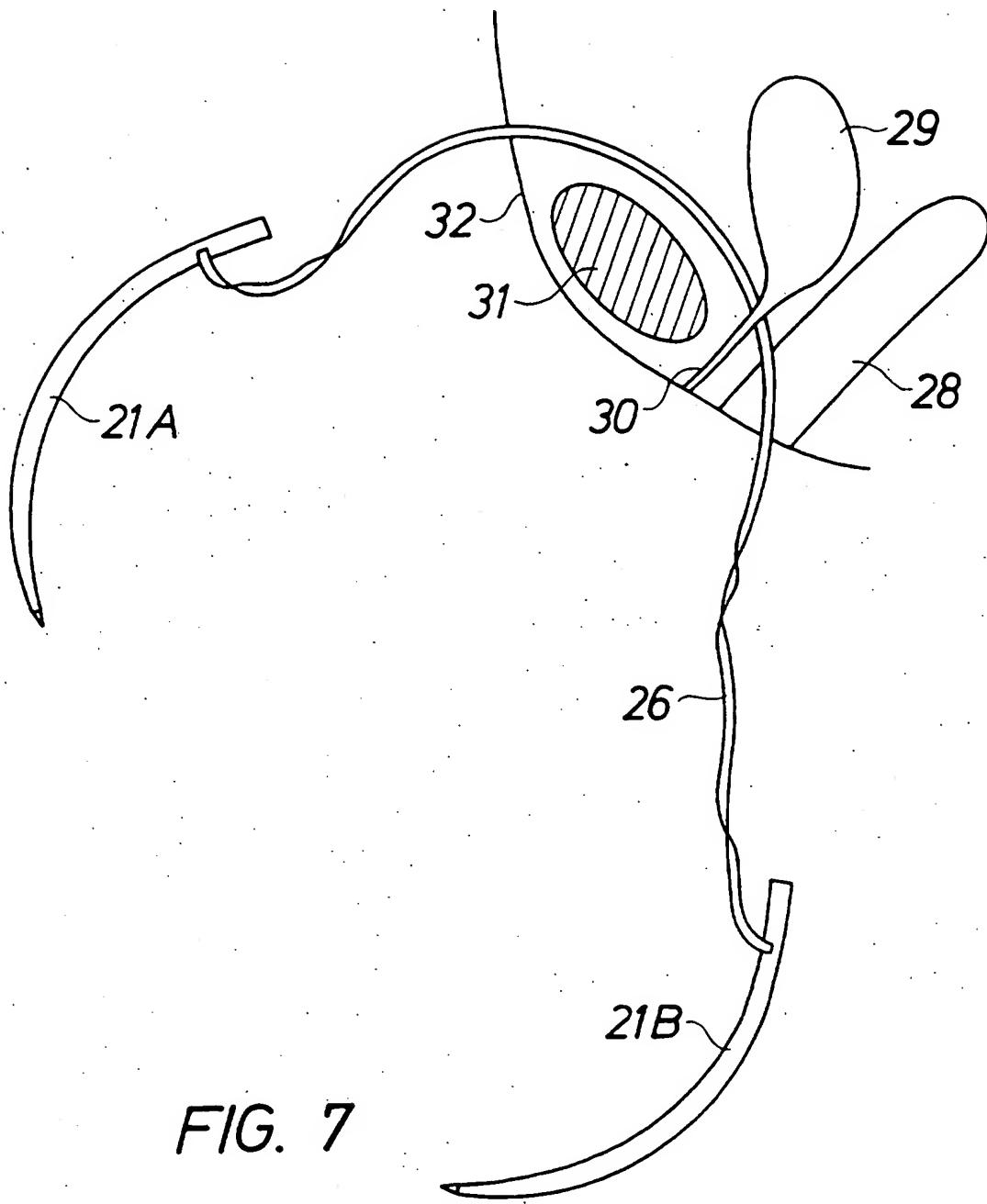


FIG. 7

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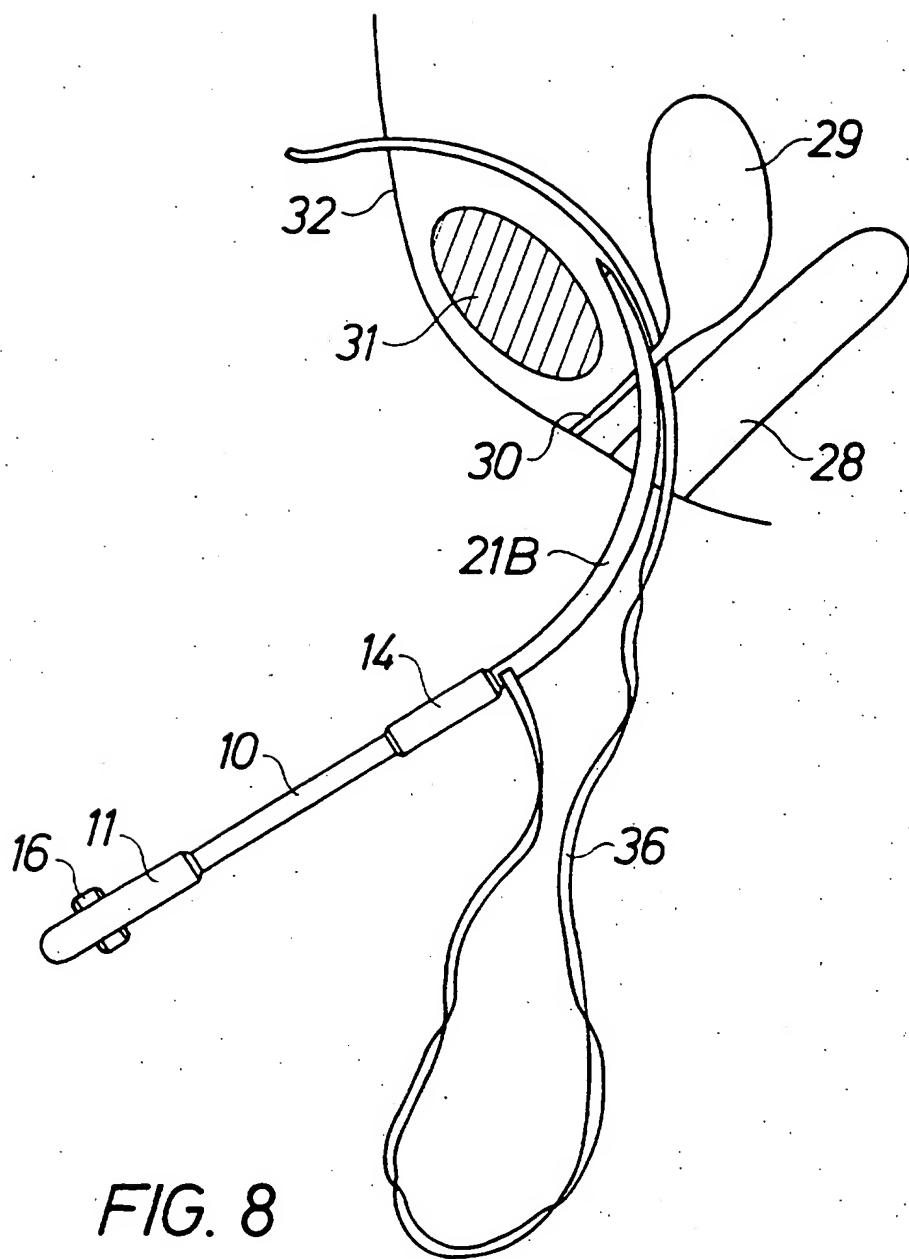


FIG. 8

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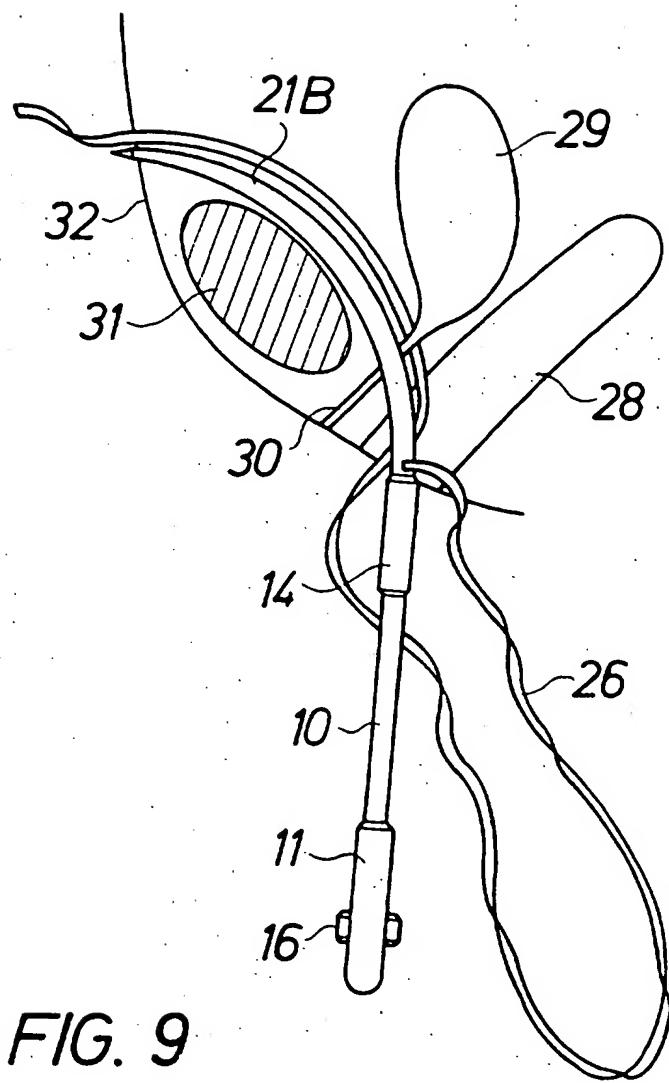
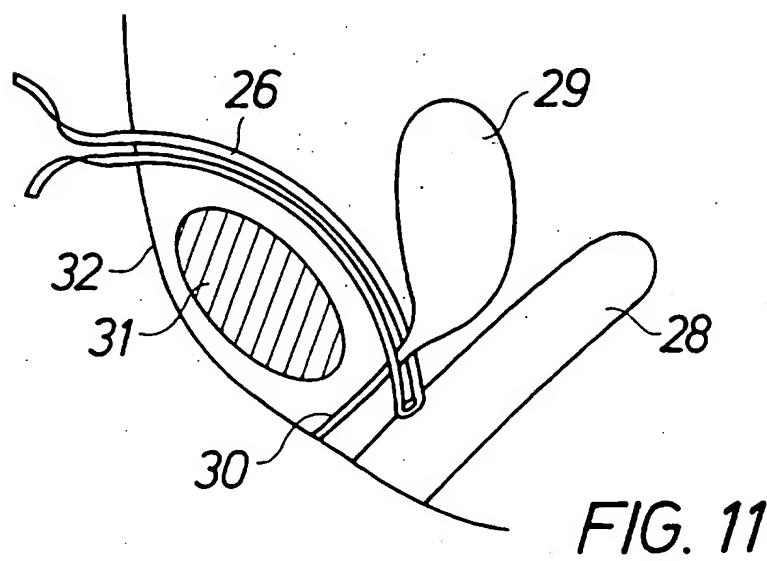
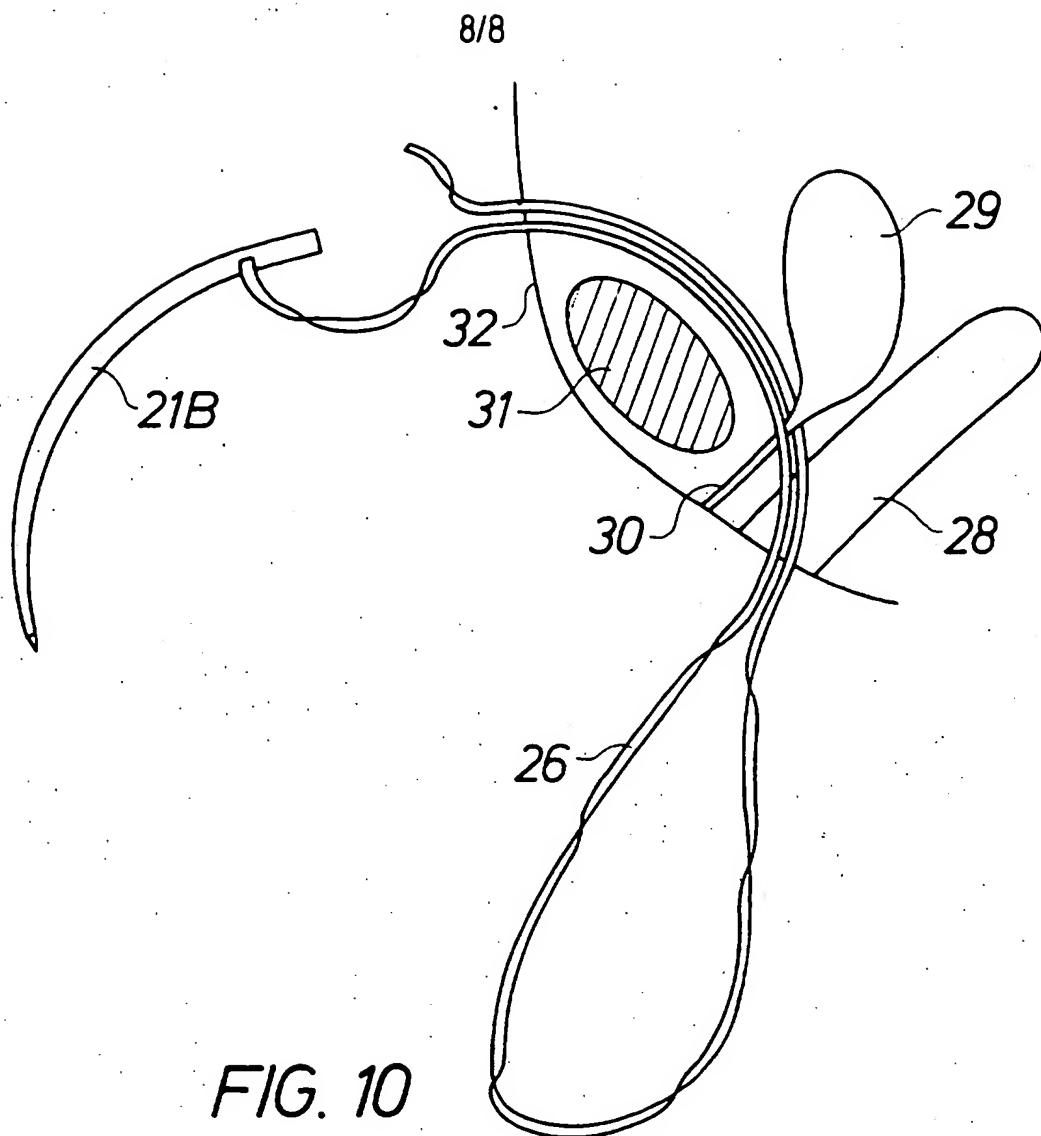


FIG. 9



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 95/00964

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61B 17/04, A61B 17/42

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A61J, A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9003766 A1 (PETROS, PETER, EMANUEL), 19 April 1990 (19.04.90), figures 1-8, claims 1-7 --	1-17
A	EP 0598976 A2 (AMERICAN CYANAMID COMPANY), 1 June 1994 (01.06.94), figure 1, claims 1-15 -- -----	1-17

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Date of the actual completion of the international search

Date of mailing of the international search report

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

30/10/95

International application No.

PCT/SE 95/00964

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9003766	19/04/90	AT-T- 119758 AU-A- 4406489 DE-D,T- 68921762 EP-A,A,B 0437481 SE-T3- 0437481 US-A- 5112344	15/04/95 01/05/90 03/08/95 24/07/91 12/05/92
EP-A2- 0598976	01/06/94	NONE	

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